The Pole Farm

When Lawrence Was a Transatlantic Communications Hub

Image courtesy Carolyn L Larson

The towers for transmitting to London were erected in early 1929.

The story of the Pole Farm begins in the late 1920s, when there were around 30 million phones in the world. Half of these were in North America and most of the rest were in Europe. The problem was that North American customers could only call other phones in North America; half of the phones in the world were not accessible to AT&T's customers.

Given the state of technology, the only option for solving this problem was radio: encoding the telephone call into a radio signal and beaming it across the ocean to a receiver on the other side. The first radio circuit was placed into operation in January of 1927. The cost was $75 (1927 dollars) for the first three minutes between New York and London. There was only one circuit; if someone was using it, everyone else had to wait.

The first radio circuit was a long wave system with a frequency of 60 kHz. Although it worked, the Bell Labs engineers did not see much of a future for long wave. So they turned their attention to the new technology of short wave.

In early 1928 they selected a receiving site near Netcong, New Jersey, on a plateau overlooking the old Morris Canal and not far from today's intersection of Route 206 and I-80. They needed an isolated location free from interference in order to pick up the faint signals from across the Atlantic.

They then set about selecting a transmitter site, and for this they had a number of criteria. First and foremost, the transmitter could not be built anywhere near the receiver; otherwise the receiver would be flooded with interference from the transmitter.

They also needed several hundred acres of flat land that would not be too expensive and would not be close to population centers. They also needed a reliable source of electric power. And finally, they needed to be close to the main AT&T telephone trunk line that runs up and down the East Coast.

And so their eyes turned to Mercer County and they began scouting sites. Old memos in the AT&T Archives first mention the Pole Farm site in late August of 1928. By this time they had already visited the site and secured options to purchase the land.

To go in and buy this much land in such a short amount of time required tremendous secrecy. The sellers were fourteen local farmers, and you can imagine how difficult it was for them to keep their lips sealed. AT&T closed on all fourteen parcels over two days on September 25-26, 1928.

There would be two buildings to house transmitters: Building One and Building Two.

Image courtesy AT&T Archives and History Center

By 1958 powerful transmitters like these made Lawrenceville the largest radiotelephone station in the world.

Building One would also contain the station's administrative offices. The site would provide three shortwave circuits to London and one to Buenos Aires. The goal was to have the first channel to London in operation by June 1st, 1929, which gave them eight months to build the infrastructure and manufacture and install the equipment. All of the designs and technology came from Bell Labs, where AT&T had dozens of engineers collaborating on different aspects of the project.

Offsite they needed to improve the local access roads, they needed to bring electricity to the site, and they needed to acquire rights-of-way to bring phone circuits up from the main trunk line near today's US-1. One happy side effect for the farmers who remained in the area was their first phone service and, in some cases, their first electricity.

The most visible landmarks on the site were the steel towers that supported the antennas. There were 26 of them, each 180 feet tall. They were placed 250 feet apart so that the end to end distance was about a mile.

But the towers themselves were not the antennas; they merely provided support. The antennas were wire mesh curtains that hung between the towers. Each radiotelephone channel needed six of these curtains.

In short wave radio, some wavelengths work better at night, some work better during the day, and some work better in the twilight of dawn or dusk. As a result, each radiotelephone circuit would switch among three different wavelengths, each of which required a corresponding antenna.

The antennas were raised and lowered at different times of day as the wavelengths were changed. Thus the towers required an elaborate winch system to raise and lower the antennas simultaneously. The wire rope used to move the antennas was sourced from Roebling in Trenton.

While all of this work was occurring at the Lawrenceville site, AT&T's counterparts in England and Argentina were busy building their own matching shortwave receiving and transmitting stations.

So in a remarkable feat of engineering and construction, in eight short months AT&T managed to bring the first channel to London online by their June 1st deadline. The remaining London channels and the South American circuit were rolled out over the subsequent nine months.

The cost of the Lawrenceville site was about $25 million in 2014 dollars, plus the cost of equivalent transmitting and receiving stations at the other end.

In 1929 traffic volume increased to 47 calls a day, although it jumped to 130 calls on the day of the stock market crash, October 29th. By 1930 AT&T was able to cut the price to $30 for the first three minutes.

The Lawrenceville site quickly became a wonder of the technological world. In 1930 the site played host to 1,500 visitors, including President Hoover's son, Herbert Jr. In 1934 an amateur radio operator wrote up the story of his visit for the ham radio journal QST. In 1937 the site even warranted a visit from one of Life magazine's top photographers, Margaret Bourke-White.

Of course, underneath the gee-whiz popular technology was a lot of serious leading-edge innovation. Engineering journals of the day provided

a running account of the latest transmitters and antennas. Of greatest practical use were innovations in multiplexing—the ability to transmit more than one phone conversation on a single radio channel. The first single sideband system was installed in 1936.

Innovations in antenna technology were taking place at the same time. In 1932 service to Bermuda was added at Lawrenceville using a new design called a rhombic antenna.

Besides being smaller and cheaper, rhombic antennas offered many technical advantages over the Sterba curtains. From 1932 on, rhombics and twin rhombics were the only antennas installed at the Pole Farm. These were the poles that gave the site its nickname. In 1939 the steel towers were torn down and sold for scrap, obsolete after only ten years.

Call volume increased to 50,000 per year in 1937. In1939, with war breaking out in Europe, Lawrenceville was transmitting directly to London, Paris, Bermuda, Buenos Aires and Rio de Janeiro. After the fall of Paris, the neutral Swiss built transmitters and receivers to connect with North America.

On December 7, 1941, Prime Minister Winston Churchill phoned President Franklin Roosevelt, with the US side of the conversation beamed through Lawrenceville. With America's entry into the war following Pearl Harbor, the character of the Pole Farm began to change. It was the only US telephone gateway to our Allies in London and it was not far from the Jersey Shore. As a result, the War Department viewed it as a target for saboteurs. The site had never before worried about security, so fences were built, lights were installed, and armed guards were posted.

Unfortunately, during wartime the standard AT&T radio technology could not provide a secure communications link. Prior to the war, all of the radiotelephone systems around the world, including the Germans, used a simple form of analog scrambling. It was enough to deter casual eavesdropping by amateurs with shortwave receivers, but it was not enough to deter a sophisticated enemy.

To monitor phone traffic between the US and London, the Germans built a listening post in a former youth hostel a few hundred yards from the Dutch coast on the North Sea. The only countermeasure that could be taken was censorship: all calls were monitored and censored in real time if the conversation began moving in classified directions.

The need for secure telephone communication across the Atlantic resulted in an intensive effort at Bell Labs to develop a more advanced form of encryption. The system that resulted was first tested in July of 1943, and once the War Department had set up its own shortwave network, all sensitive traffic moved off the public AT&T network. By the end of 1943, the Pole Farm no longer carried confidential conversations.

After the war, demand for international calling was growing. By 1948, the site housed 31 transmitters beaming to 26 countries through 46 rhombic antennas. One lesson of World War II was that every country in Europe wanted its own direct shortwave connection to North America.

In 1955 for the first time the facility handled one million calls, which grew to 2.5 million two years later. In 1957 a new wing was added to Building One to house 24 more transmitters. At this point Lawrenceville was the largest radiotelephone station in the world, with a shortwave power output of one million watts.

With only 830 acres to work with, and with each twin rhombic occupying ten acres, AT&T really had to pack them in. At this point the site had been almost completely stripped of trees and all extraneous buildings had either

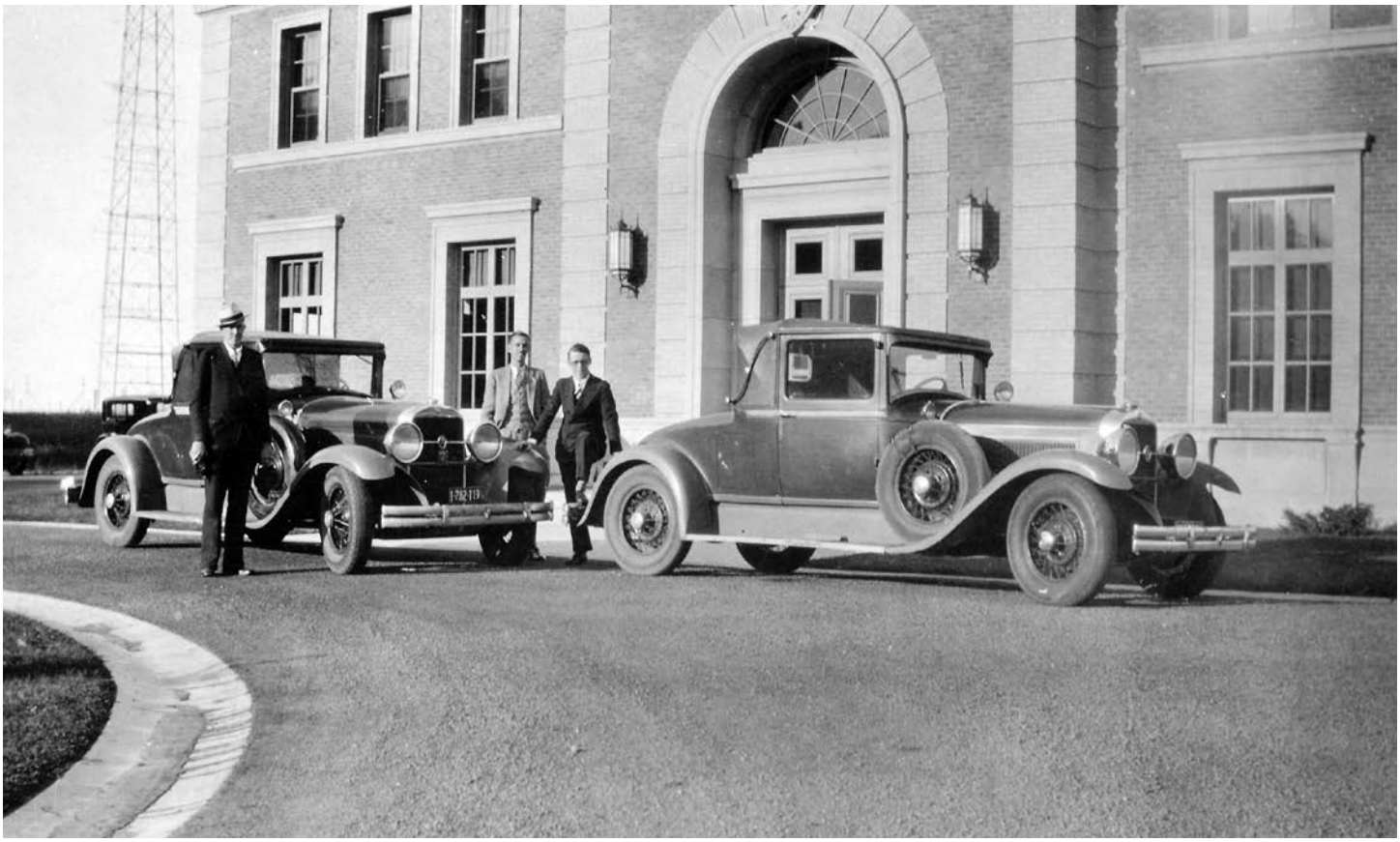

Image courtesy of Carolyn L Larson

Radio engineers outside transmitter building #1 ca. 1930.

been demolished or moved off the site.

1963 was the busiest year for the Pole Farm. Six million telephone calls were funneled through the station. It was also the year of AT&T's final big investment at the site. Construction was begun on a new wing at Building One to house an enormous emergency diesel generator. This generator could supply 1.5 megawatts, which was enough to power the entire facility.

1963 marked the high water mark for the site. After that, the Pole Farm began a long, slow decline. Once itself a technological leader, it fell victim to even newer technology.

In 1956 the first telephone cable was laid across the Atlantic. More cables were laid and by 1965 there were over 300 cable circuits between the US and Europe. This was far more capacity than the Pole Farm provided, and shortwave radio assumed a backup role for the high-traffic circuits to Europe in case a cable was cut.

1965 saw the launch of the Early Bird communications satellite. Satellites could provide high-quality, cost-effective service to smaller, more remote locations where the undersea cables did not go.

By the late 1960s poles had started to come down as circuits to more and more cities were discontinued. 1973 AT&T made the decision to close Lawrenceville. The lights went out on December 31st, 1975. By that time only 13 antennas remained standing and the site served only five cities. The sole live circuit was to Guantanamo Bay and it carried only a few calls a day.

Once the Pole Farm was closed, AT&T was quick to demolish the facility. All that remained was a single 80-foot pole left standing at the request of a local farmer who said he needed a lightning rod to protect nearby buildings. This was part of the twin rhombic that had served Tel Aviv.

AT&T continued to own the site for two decades, and leased most of the land to local farmers. In the early 1990s it reached an agreement to sell to developers who wanted to construct an exclusive community built around golf courses. After much local opposition to this plan, Mercer County stepped in and purchased the property in 1995 for $8.6 million.

Today, as part of the Mercer Meadows county park, the Pole Farm tract has been set aside for passive recreation. Many miles of new hiking and biking trails have been built, and the county has installed interpretive signs that tell the story of the site's role in telecommunications history. Every week hundreds visit this beautiful preserved open space and try to imagine what it was like there when it was the nerve center of transatlantic communications.

Image courtesy of Marie Hutnik and Family

The barn used by AT&T workers at the Pole Farm is still in use at the Mercer Meadows park.

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This program is made possible, in part, by a grant from the Mercer County Mercer County Cultural & Heritage Commission, Division of Culture and Heritage, in partnership with the New Jersey Historical Commission, Division of Cultural Affairs/ Department of State